REPORT ON A WATER POLLUTION SURVEY OF THE CITY OF WOODSTOCK

The Honourable
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minister

Everett Biggs
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February 7, 1974

The Corporation of the City of Woodstock
Box 40
WOODSTOCK, Ontario
N4S 7W5

Attention: Mr. K.Miller, Clerk

Dear Sir:

RE: CITY OF WOODSTOCK - Water Pollution Survey

We are forwarding a copy of a report of a water pollution survey conducted in the City of Woodstock during 1972.

The survey revealed that widespread pollution of local watercourses is not apparent. However, expenditures are required to provide adequate sewage treatment facilities for future growth based on more stringent criteria for determining the waste assimilation capacity of the Thames River as it passes through the City of Woodstock.

The report contains six recommendations for your consideration and action. In particular, we would like to draw your attention to three recommendations which we feel require a high priority in the undertakings of the City of Woodstock in the coming year:

1. With the raw sewage flows during 1972 at 100 percent of secondary treatment capacity and the incapability of the chlorination facilities to treat all flows directed to the sewage treatment plant, there is a present need for improvements and additions to the sewage treatment plant to provide treatment of all sewage flows directed to these works to a level acceptable for discharge to the Thames River. The City of Woodstock should retain a consulting engineer to determine and design the appropriate facilities to be constructed.

2. With the documented infiltration in the trunk sewers and the average daily raw sewage flow during 1972 at 110 percent of the average daily water consumption, the need for an extensive infiltration study of the sanitary sewer

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collector system is indicated, to search out defective sections of sewer. A construction program of rehabilitation should be initiated following any infiltration studies.

3. The consulting engineer should consider closely the association between high infiltration rates in the sewage collector system and hydraulic capacity of the sewage treatment plant in determining the appropriate facilities to be constructed.

We are pleased to note that as a result of discussions with your City Engineer's Department during the preparation of this report, a consulting engineer has been retained by your municipality to prepare a report on the sewage treatment facility requirements and conduct an infiltration study of the trunk sanitary sewers.

There are, however, other recommendations and observations contained in the report which we would like to draw to Council's attention. After Council has had an opportunity to study the report, we would like to meet to discuss the report fully, answer any questions you may have, and work out a mutally satisfactory program of correction and development of sewage treatment facilities to serve the continuing development within the City of Woodstock.

In conclusion, we wish to acknowledge that the City of Woodstock is significantly minimizing the pollution loads directed to the Thames River and we appreciate your municipality's co-operation in this regard. However, we also realize that there is still work to be done to provide adequate sewage treatment facilities for future growth and completely eliminate pollution emanating from Woodstock and we look forward to your continued co-operation in solving this problem.

Yours truly

J.M. Timko, P. Eng.
Regional Engineer
Sanitary Engineering Branch

WP/cs
Encls.

POLLUTION

REPORT

ON A

WATER POLLUTION SURVEY

OF THE

CITY OF WOODSTOCK

COUNTY OF OXFORD

APRIL 1972

REGIONAL ENGINEERS SECTION

SANITARY ENGINEERING BRANCH

WATER SUPPLY AND POLLUTION CONTROL DIVISION

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INTRODUCTION

The following is a report on the status of municipal water pollution control within the City of Woodstock as revealed during a water pollution survey conducted within the Municipality during the week of April 24 to April 28, 1972. Surveys of this nature are conducted routinely and upon request by the Sanitary Engineering Branch of the Ministry of the Environment to provide the basis for assessing the general quality of the water within the local water courses and establishing the adequacy of the water supply system, sewage treatment facilities and storm drainage facilities for the present and projected future populations. During the conducting of the survey, existing and potential sources of pollution that are found are documented. Corrective action is requested by the Ministry of the Environment where sources of pollution are found.

GENERAL

The City of Woodstock, the county seat of Oxford County, is located at the junctions of Highways No. 2 and 59 and Highways No. 59 and 401, approximately 30 miles east of the City of London. The 1971 assessed population was 25,081 as listed in the 1972 Municipal Directory. This is an increase of 4,771 over the 1961 assessed population of 20,303. An average yearly population growth of 2.3 percent over the last ten years is indicated. However, during the latter part of the decade, the growth rate was

less than 1 percent, which is somewhat less than the provincial average of 2.2 percent.

The present total acreage within the corporation limits of the City of Woodstock is 6,110 acres, of which 3,015 are developed, the remainder being classified as agricultural. The city's planning consultants have estimated the population capacity within the present city boundary to be 70,000 persons. At a 2 percent annual growth rate, this population would be reached by the year 2020. At present, close to 70 percent of existing residential units are classified as single family units. New subdivisions comprising both single family and multiple family units are under development and construction in the south-easterly and north-easterly outlying areas of the city. Much of the older industrial development of the city is contained in a central area east of the Thames River and north of Cedar Creek. These industries are generally established on smaller lots. Newer industrial development has occurred in the easterly area of the city where generally much larger tracts of land have been acquired.

A major portion of the labour force is employed in the manufacture of textiles and fabricated metal products and the assembly of equipment and motor vehicles for mining industrial and construction usage.

Drainage from the city reaches the Thames River directly by storm sewers and small creeks which rise in the south-eastern

sector of the city and meander in a north-west direction to discharge to the Thames River. Certain sections of these creeks have been enclosed to act as municipal storm sewers.

The entire developed area of the city is served by the municipal water supply system with virtually all this area being provided with a sanitary sewerage and storm sewerage collection system. For the most part they are separate systems; however, some of the system is combined.

MUNICIPAL WATER WORKS

Physical Description

Water for the city is presently supplied by five overburden wells ranging in depth from 56 feet to 100 feet located at the Tabour Springs and Thorton Springs in the Sweaburg Road area to the south of the city. Two bedrock wells located within the city boundaries are used to meet peak consumption demands.

Water from the overburden wells is pumped and flows by gravity to a suction well and raw water storage reservoir at the high lift pumphouse located at Southside Park. Chlorination is the only treatment provided before distribution to the consumers. One of the bedrock wells is located at the high lift pumphouse and when required is pumped to the suction well. The other bedrock well is located in Sutherland Park and requires aeration to remove hydrogen sulphide and filtration to reduce the high iron concentration. This water is pumped directly to the distribution system

after chlorination.

The present plant capacity is 8.85 MGD as limited by the pumping capacity of the wells. Storage is provided by a 1.25 MG, a 0.75 MG and a 2.0 MG ground level storage reservoir giving a total available storage to 4.0 MG on the pressure side of the high lift pumps.

Water Consumption

During 1972 the average daily consumption was indicated to be 3.99 MG. In 1961 the average daily pumpage was 3.40 MG indicating an increase of 15 percent. This compares favourably with the population increase for the decade of 23 percent. The maximum daily pumpage in 1972 was 6.78 MG as compared to 4.0 MG per day in 1961. This is an increase of 70 percent indicating that improved pressure throughout the distribution system has made water available to meet peak hourly demands. The maximum daily pumpage in 1972 of 6.78 MG was 76.5 percent of the plant capacity.

Per capita water consumption, based on a population of 26,881 which includes a population of 1,800 at the Ontario Hospital, is 148 gpd. An average per capita consumption of 100 gpd is experienced in most municipalities of this size in Ontario. This high consumption rate is attributed to several high water usage industries in the city, the primary ones being Standard Tube Canada Limited, La France Textiles (Canada) Limited, Silverwood Dairies Limited, Harvey Woods Limited, and Firestone Textiles Limited. During 1972

the industrial water usage accounted for 48 percent of the total water consumption.

At the present per capita consumption of 148 gpd, the capacity of the water supply system should be capable of supplying the maximum day demand for a population of 34,000. At a projected yearly population increase of 2 percent, this population would be reached in 1983.

Water Quality

Based on the results of samples collected by the Oxford County Health Unit, the water being supplied to the consumer is bacteriologically satisfactory.

Chemically, the water from all the wells is very hard. The bedrock well in Sutherland Park has a very high iron content while the other bedrock well and one of the overburden wells exceeds somewhat the Ministry's objective for iron concentration of 0.3 ppm. The Sutherland Park well also has a high hydrogen sulphide content which is removed by aeration. The water being supplied is of otherwise satisfactory chemical quality.

MUNICIPAL WATER POLLUTION CONTROL FACILITIES

Water Pollution Control Plant - Physical Description

The City of Woodstock is presently served by a conventional activated sludge sewage treatment plant located on the north side of Admiral Street opposite Given Street. There is sufficient

land available at this site to accommodate expansion of the treatment facilities to serve the ultimate population of 70,000 persons that can be accommodated within the present municipal boundaries.

The present plant capacity is 4.5 MGD for secondary treatment and 7.1 MGD for primary treatment. Flows much in excess of 4.5 MGD are by-passed the secondary treatment and flows in excess of 7.1 MGD are by-passed the primary treatment. Flows by-passing the plant do not receive chlorination prior to discharge to the Thames River. Sludge disposal is by means of two sludge digesters, then trucking to land disposal sites.

Sanitary Sewer Collector System

There are six main trunk sanitary sewers serving the city, three of which flow by gravity directly to the treatment plant while three flow by gravity to the Bexley Street pumping station at the intersection of Hunter Street and Bexley Street from whence the sewage is pumped approximately 1,300 feet to the main interceptor sewer on Given Street. All future development will be connected to these trunk sewers.

An infiltration study of the sanitary trunk sewers was conducted by the Ontario Water Resources Commission in 1961. A summary of its findings is given below:

TRUNK SEWER	ANTICIPATED SANITARY FLOW IGPD	MEASURED INFILTRATION IGPD	INFILTRATION IN TRUNK SEWER AS PERCENTAGE OF TOTAL INFILTRATION	INFILTRATION AS PERCENTAGE OF ANTICIPATED SANITARY FLOW IN EACH TRUNK SEWER
Main Interceptor	600,000	900,000	33.0	150
North-East Trunk	947,000	441,000	16.4	47
North Trunk	627,000	474,000	17.6	75
Southwest Trunk	278,000	210,000	7.8	75
South Trunk	130,000	208,000	7.7	160
South-East Trunk	126,000	458,000		
	2,703,000	2,691,000	100	

Note: The anticipated sanitary flow was calculated by multiplying the tributary area in acres by 1000 gallons per day.

The study points out that the infiltration flows are equal to 100 percent of the sanitary flow. Generally, most municipal sewerage systems are designed for no more than a 20 percent infiltration flow rate. The infiltration flow rates determined in this study indicate that up to 50 percent of the flow reaching the sewage treatment plant can be attributed to infiltration. This results in high hydraulic loading on the sewage treatment plant and dilute raw sewage which makes efficient treatment difficult to achieve.

While the study was carried out some eleven years previous, the extent of construction programs to eliminate infiltration, undertaken to date, indicates that much the same rates of infiltration probably exist at the present.

The present population of the City of Woodstock is 25,081. Of this population, 7,500 or 32 percent are in areas served by the south, south-east and south-west trunk sewers, tributary to the Bexley Street pumping station. The remaining 17,580 or 68 percent is served by the main interceptor, north and north-east trunk.

Of the total acreage of 6,110, the portion tributary to the Bexley Street pumping station is 2,850 acres indicating an ultimate contributing population of 33,000. A further 500 acres is tributary to the main interceptor by gravity flow. The north and north-east trunk sewers have a contributary area of 2,670

acres with an ultimate contributing population of 30,000. Studies carried out by the municipality's consulting engineer, Gore & Storrie Limited, have indicated that the combined capacity of the north-east trunk sewer is 11.2 IMGPD which would be sufficient for the ultimate contributary population of 30,000 at a maximum design flow rate of 300 gpcd.

The south-east, south-west and south trunk sewers have a capacity in excess of 25 IMGPD which is more than sufficient for the maximum expected sanitary flow of 10 IMGPD from the ultimate contributary population of 33,000. The section of the main trunk on Given Street up to the sewage treatment plant is indicated to have insufficient capacity to accept the ultimate discharge of 10 IMGPD from the Bexley Street pumping station as well as the gravity flow received. Plans have been prepared by Gore & Storrie Limited and tenders are to be let in 1973 for the construction of a 48-inch diameter trunk sewer from the present site of the Bexley Street pumping station to the sewage treatment plant. A sewage pumping station is to be constructed at the treatment plant site with provision for accommodating sufficient pumping units to handle the ultimate design sewage flow of 10 IMGPD. The existing Bexley Street pumping station will be removed from service. The main trunk sewer will then no longer convey the flows from the south, south-east and south-west trunk sewers to the treatment plant.

Storm Sewers

Storm drainage for the City of Woodstock is provided by storm sewers, municipal drains and local watercourses.

The Thames River is the ultimate receiving watercourse for all storm water discharges. The north-central section of the older section of the city is drained by the north storm trunk sewer, discharging to the Thames River north of the municipal sewage treatment plant site. The northern and north-eastern section of the city is served by the combined north-east trunk sewer discharging to the sewage treatment plant with an overflow provided, discharging to the Thames River just downstream of the Pittock Lake dam. The central core of the city is served by storm sewers discharging to Cedar Creek while the south-eastern section of the city is served by storm sewers discharging to Spring Creek, which then outlets to Cedar Creek at Southside Park. The south-western portion of the city is drained by Golf Course Creek which rises in the area of the sanitary landfill site and empties into Cedar Creek at the CNR right-of-way.

Combined Sewers

There still remain sectors within the City of Woodstock served by combined sewer systems. The north-eastern section of the area bounded by Huron Street on the east, Dundas Street on the south and the corporation limits on the west is served entirely by combined sewers which discharge to the north-east trunk sewer.

In addition, certain areas within the sector bounded by Fairview Crescent on the west, Devonshire Avenue on the south and Huron Street on the east are served by combined sewers.

Plant Flows

The sewage treatment plant has a rated capacity of 7.1 IMGD, primary treatment and 4.5 IMGD, secondary treatment. Flows in excess of 5.0 IMGD are presently by-passed secondary treatment and chlorination while flows in excess of 7.1 IMGD are by-passed the treatment plant entirely, being discharged to the Thames River without treatment. In 1971, 2.7 percent of the metered flow reaching the sewage treatment plant was by-passed secondary treatment and chlorination. During 1972, this by-passing increased to 4.7 percent. This increase is attributed to the effort by the operating authority to restrict all flows in excess of 5.0 IMGD to primary treatment only, so that a hydraulic overload of the secondary treatment facilities does not occur.

Appendix IV, Table I, summarizes the sewage flows for 1972. It is noted that the recorded flows indicate the average daily flow for each month to exceed the secondary treatment capacity during seven months of the year, primarily in the spring thaw period and early winter months. The average daily flow over the year was 4.51 IMGD which is a 11.2 percent increase over 1971 while at the same time the average daily water consumption decreased by 6.8 percent. A review of the sewage flows and water pumpages for 1971

4.5 IMGD for 24 hr = 2688 = 167.

N x PC = 4.5 = 173 gcd

indicated a 2.8 percent decrease in the average daily sewage flow from 1970 and a sewage flow of only 95 percent of the average daily water consumption. With the documented infiltration encountered in the trunk sewers, the accuracy of the recorded flows at the treatment plant and the accuracy of the flow recorders was questioned. During 1972, the flow recorders were inspected and recalibrated. The sewage flows recorded during 1972 were indicated to be 110 percent of the average daily water consumption. Appendix IV, Table 2, summarizes the average daily water consumption and average daily sewage flows in the last five years. For 1972, the average daily sewage flow was 100 percent of the secondary treatment capacity and 64 percent of the primary treatment capacity.

Reportedly, during periods of high precipitation and during spring thaw periods, surcharging of the parshall flumes occurs on the raw sewage by-pass. To accurately determine these by-passed flows, an adequately sized flow meter should be provided. There are also raw sewage overflow sewers at the Bexley Street pumping station, on the North trunk sewer just north of the sewage treatment plant and on the North-East trunk sewer which is a combined sewer just south of the Pittock Lake dam. None of these overflow sewers are metered. The discharge of raw sewage to the Thames River is a major source of pollution in the City of Woodstock. In order to determine the quantity and frequency of raw sewage by-passing, flow meters should be installed in all overflow facilities

within the municipality. With the information provided by the flow meters, appropriate action can be planned and undertaken by the City of Woodstock to decrease the pollution load to the Thames River.

Flow records indicate that sewage flows received at the sewage treatment plant decrease greatly during the week-end period when industries are closed indicating that there is a high industrial contribution to the sewage flow, especially from the textile industries.

In an effort to reduce the sanitary flows, a survey was carried out by the city during the summer of 1971 to locate all roof leaders connected to the sanitary sewers. Owners of homes having such a connection have been notified by the city that the connection is to be severed. Most home owners have complied with the city's requirements; however, with the difficulties encountered with the flow meters at the sewage treatment plant, it is difficult to assess, at this time, the success of this program. The accurate recording of sewage flows in the future should show any success realized from this program.

Plant Loading and Removal Efficiency

Appendix V summarizes the average BOD_5 and the suspended solids concentration of the raw sewage and final effluent over the

last five years. These averages are based on the results of weekly tests performed in the laboratory at the City of Woodstock sewage treatment plant and where noted in the Ministry of the Environment laboratory in London. It should be noted that the results from the two laboratories are at variance with regard to the BOD_5 determinations. The laboratory procedure and equipment at the sewage treatment plant laboratory should be reviewed and examined in consultation with the Ministry of the Environment laboratory personnel to achieve uniformity of analyses results.

During 1972, the average daily BOD_5 loading to the treatment plant was indicated to be 5,850 pounds based on laboratory analyses results from the sewage treatment plant laboratory which is close to 72 percent of the organic loading capacity of the sewage treatment plant.

The efficiency of the sewage treatment plant in treating flows directed to it is indicated to be generally satisfactory, based on the results from the laboratory at the sewage treatment plant. During 1972, the treatment plant was 95 percent efficient in achieving an average effluent suspended solids concentration of 11 ppm and 91 percent efficient in achieving an average effluent BOD_5 concentration of 12 ppm. The removal efficiencies at the treatment plant over the last five years is given in Appendix V.

Chlorination

Chlorination facilities provided at the treatment plant allow for chlorination of the secondary effluent only. Any primary

effluent discharges and plant by-pass flows are discharged without chlorination to the Thames River.

The chlorinator in use at the treatment plant has a maximum feed rate of 500 pounds per 24 hours, providing a maximum chlorine dosage of 11.1 ppm for the average daily sewage flow receiving secondary treatment which should adequately disinfect the secondary treatment effluent. A sufficient retention time of 23 minutes is provided. However, sufficient chlorination feed rate capacity and chlorine contact chamber capacity are not available to direct treatment plant by-pass flows and secondary treatment by-pass flows to the chlorination facilities. The capacity of the chlorination feed rate and chlorine contact chamber capacity should be increased to provide chlorination of all sewage flow directed to the sewage treatment plant including by-pass flows in order that the bacterial load in the effluent to the Thames River is decreased.

Proposed System Expansion and Improvements

Studies have been completed at the sewage treatment plant to determine the proper facilities to be installed for phosphorus removal. The method of phosphorus removal determined to be the most appropriate is chemical precipitation of phosphorus by the addition of ferric chloride to the aeration section. These facilities are scheduled to be installed before the end of 1973.

Plans have been finalized and tender documents are being prepared by the city's consulting engineer, Gore & Storrie Limited,

for the construction of a 48-inch trunk sewer from the existing Bexley Street pumping station to the sewage treatment plant site. A new sewage pumping station is to be constructed at the treatment plant site with a forcemain into the plant.

At present, no infiltration studies have been scheduled by the city. However, the city is carrying out a yearly program of storm sewer construction with a yearly budget of close to $60,000. The continued construction of storm sewers should reduce the storm flows reaching the sanitary trunk sewers. It is noted that the items included by the city engineer in the capital budget for the years 1972 to 1976 for water pollution control facilities included alterations to the chlorination facilities in 1974, extension of the aeration section in 1975, additional pumping facilities and final settling tank in 1976. Expenditures on water pollution control facilities for 1972-1976 are summarized in Appendix VI.

The Water Quantity Management and Water Quality Branches of the Ministry of the Environment are presently engaged in a water resources study of the Thames River Basin. Waste loading assimilation studies are being conducted to determine permissible levels of discharge of BOD_5 and suspended solids from individual sewage treatment plants in the Thames River Basin. Pending the results of these studies, a higher degree of sewage treatment than presently achieved by the type of sewage treatment plant serving the City of

Woodstock may be required. However, with the sewage flows to the sewage treatment plant during 1972 at 100 percent of secondary treatment capacity, there is a present need for improvements and additions to the sewage treatment plant to provide treatment of all sewage flows directed to these works to a level presently acceptable for discharge to the Thames River. To ensure a minimum period for the completion of these improvements, the City of Woodstock should retain a consulting engineer as soon as possible.

The consulting engineer should work in close consultation with municipal officials and Ministry of the Environment personnel to ensure that appropriate facilities are proposed that will best serve the needs of the City of Woodstock and maintain satisfactory water quality of the Thames River.

SURVEY PROCEDURE AND PRESENTATION OF RESULTS

Introduction

The intent of this survey was to locate all storm sewer outfalls, drainage ditches and other points of discharge to determine in general the extent of pollution conveyed by these outfalls, drains and ditches to the local watercourses within the corporation

limits of the City of Woodstock.

During the survey, field observations were made where possible of all outfalls with regard to location, type of pipe, size of pipe, type of outfall (whether submerged or free flowing) estimate of flow or evidence of recent flow and water quality of the discharge.

Grab samples were collected at numerous outfalls at the point at which they discharge into the watercourse. In addition, watercourse samples were taken at varying intervals along the watercourses flowing through the city. The samples were analysed for some or all of the common water pollution indicators, namely biological oxygen demand (BOD_5), suspended solids, kjeldahl nitrogen, total phosphorus, anionic detergents and fecal and total coliform counts per 100 ml.

The field observations of all outfalls located have been summarized by watercourse and are provided in Appendix II. The survey map enclosed with the report is also provided to aid in the location of the observation points in the field. Generally, the observation and sampling point numbers follow the direction of flow of the watercourse with increasing numerical magnitude. Laboratory analyses and bacteriological examination results of samples collected have been summarized and are provided in Appendix III.

Discussion of Field Observations and Sample Results

A total of 54 points of discharge or potential discharge are summarized in the tabulation of field observations in Appendix II. Of these points, a significant flow was found and samples at eighteen points. In addition, a total of twelve samples were collected from varying locations throughout the local watercourses. The laboratory analyses results of samples collected are tabulated in Appendix III. An enclosed survey map indicates the location of the field observation points, the outfall sampling points and the watercourse sampling points.

Of the eighteen points of discharge sampled, six were found to be a contributing source of pollution as indicated by one or more of the common water pollution indicators. These unacceptable discharges, as well as the general water quality of the local watercourses are presented below:

Golf Course Creek

Golf Course Creek watercourse samples UC-01, east of Russel Street and north of Albert Street; sample UC-02 at the dam in the Woodstock Golf Club and sample UC-03 (CC-72) at the discharge of Golf Course Creek to Cedar Creek just east of the CPR right-of-way contain high BOD_5 concentrations. Sample UC-01 contains, in addition, a high suspended solids concentration. Golf Course Creek is a spring-fed watercourse rising in the area of the old sanitary landfill site located north of Parkinson Road

and east of Mill Street. A 60-inch concrete storm sewer passing through the sanitary landfill site discharges into the upstream end of the creek. The creek emerges through an open channel from a 36-inch concrete storm sewer at Mill Street and just south of Sixth Avenue. Sample UC-01 collected at this point indicates that a source of pollution is entering the creek at a point or points upstream. An inspection of the storm sewer passing through the old sanitary landfill site should be made to determine if leachate through the sanitary landfill is infiltrating the storm sewer. The storm sewer from Parkinson Road to Mill Street and Sixth Avenue should also be inspected for any sanitary and industrial waste connections. Samples UC-02 and UC-03 do show a reduction in the BOD_5 and suspended solids in the Golf Course Creek as it flows towards Cedar Creek. However, at the discharge to Cedar Creek, the pollutant strength was still among the highest of all discharges sampled.

Cedar Creek

Generally, the water quality of Cedar Creek was satisfactory, at the time of the sample collection, as far downstream as Main Street as indicated by the analyses results of samples CC-01 at Highway 401, sample CC-08 at Parkinson Road and sample CC-56 at Main Street. With the discharge of Golf Course Creek, sample CC-72 (UC-03) at the CPR right-of-way and the discharges from the South Sewage Disposal area, located to the west of the

CPR right-of-way and south of Cedar Creek, designated as samples CC-76 and CC-77, the water quality of Cedar Creek deteriorates rapidly with regard to bacterial quality. This deterioration is exemplified by sample CC-56 at Main Street where fecal and total coliform counts were twelve and 1400 per 100 ml, respectively, and sample CC-80 at the confluence with the Thames River where the fecal and total coliform counts were 128 and 120,000 per 100 ml, respectively.

The natural drainage channel discharges, designated CC-74 and CC-76 contain high total coliform and fecal coliform counts, high nutrient levels and significantly high BOD_5 and suspended solids concentrations. These natural channels were draining ponded water from the area of the abandoned south sewage disposal site. The ponded water was the result of the by-passing of raw sewage from the manhole chamber where the south trunk sewer discharges to the south-east trunk sewer.

Subsequent to the conduction of the field activities of the pollution survey, and after discussions with the City Engineer, the by-pass at the south sewage disposal area was blocked. This resulted in by-passing at the Bexley Street pumping station to the ponded water area west of Standard Tube Limited and east of the Thames River. By June of 1973, sewage flows in the south-east trunk sewer were continuously greater than the pumping capacity of the Bexley Street pumping station, and continuous by-passing of raw sewage to the Thames River was occurring. The municipality

was requested to provide additional pumping capacity at the Bexley Street pumping station to direct the by-pass flows to the sewage treatment plant. These facilities were installed and in operation within one month after being requested.

The holding tank and ponded water area at the south sewage disposal area remain as a public health hazard and as such should be drained and the holding tank covered or fenced.

Thames River

Generally, the water quality of the Thames River from the north-eastern corporation limit at Pittock Lake and Lansdowne Avenue is satisfactory to just above the sewage treatment plant as noted from samples PL-S-09-Pittock Lake at Lansdowne Avenue, sample TR-03-Thames River at Pittock Lake dam, sample TR-05-Thames River opposite Admiral Street, upstream of the sewage treatment plant outfall. Samples designated PL-S-04, PL-S-05, PL-S-07 and PL-S-08 indicated the drains entering Pittock Lake from the south shore to be contributing minor quantities of pollution at the time of the field survey.

A comparison of Thames River samples TR-07A above the sewage treatment plant outfall and sample TR-10-Thames River at Governor's Road indicated a deterioration of the water quality of the Thames River. A significant increase in BOD_5 concentrations from 2.4 ppm to 6.5 ppm was determined. The total coliform counts and fecal coliform counts increased greatly from 220 to 80,000

total coliform counts per 100 ml and from less than 4 to 32 fecal coliform counts per 100 ml. The sewage treatment plant effluent sample TR-07 contains a high BOD_5 and suspended solids concentration and excessively high fecal and total coliform counts. No other points of discharge in this section of the river were observed discharging at the time of sampling which indicates that the deterioration of the water quality of the Thames River resulted from the sewage treatment plant effluent.

Sample TR-07A collected from the sewage treatment plant effluent contained a BOD_5 concentration of 46 ppm and a suspended solids concentration of 30 ppm. These concentrations greatly exceed those levels acceptable for discharge to the Thames River that would cause minimum water quality impairment. Total and fecal coliform counts of 20,000 and 10,000 per 100 ml, respectively, indicated that effective chlorination of the sewage treatment plant effluent was not taking place. The adverse effect of this discharge on the water quality of the Thames River was exemplified by Thames River samples TR-07A and TR-10.

SUMMARY AND CONCLUSIONS

A water pollution survey of the City of Woodstock was conducted during the week of April 24 to April 28, 1972. The intent of the survey was to locate all storm and sanitary discharges to the local watercourses within the corporation limits of the municipality and to determine the extent of any water quality impairment

of these watercourses. Evaluation of the capabilities and deficiencies of the municipal water supply system, sewage treatment plant and sewage collector system was made to determine the present status of municipal water pollution control within the City of Woodstock.

The municipal water works has a present capacity of 8.85 MGPD as limited by the pumping capacity of the wells and ground level storage on the distribution system, totalling 4.0 MG. The average daily water consumption during 1972 was indicated to be 3.99 MG which is 45 percent of the water works capacity. The per capita consumption is indicated to be 148 gpcpd, and at the present maximum day demand of 6.78 MG, the water works should be capable of supplying a population of 34,000. The water being supplied to the consumer is of satisfactory bacteriological and chemical quality.

The municipal sewage treatment plant has a primary treatment capacity of 7.1 MGD and secondary treatment capacity of 4.5 MGD. Flows much in excess of 5 MGD are by-passed secondary treatment, while flows in excess of 7.1 MGD are by-passed all treatment. All flows by-passing primary and secondary treatment do not receive chlorination prior to discharge to the Thames River. Records maintained by the operating authority at the sewage treatment plant indicate that the average daily flow over the year 1972 to be 4.5 MG which is 100 percent of the secondary treatment capacity and

64 percent of the primary treatment capacity. Of the total sewage flow directed to the municipal sewage treatment plant during 1972, records maintained indicate that 4.7 percent by-passed secondary treatment and 0.7 percent by-passed primary and secondary treatment.

The average daily sewage flow recorded in 1972 was indicated to be 110 percent of the average daily water consumption. Generally, sewage flows are found to be 80 percent of the water consumption. This high sewage flow is attributed to the high infiltration rates being experienced in the trunk sewers and documented in an OWRC report in 1961. No sewer infiltration studies have been initiated by the City of Woodstock in an effort to reduce the sewage flows directed to the sewage treatment plant.

Raw sewage overflow sewers were located during the pollution survey at the Bexley Street pumping station, on the North trunk sewer just north of the sewage treatment plant and on the North-East trunk sewer just north of the Pittock-Lake dam. To enable a determination of the quantity and frequency of raw sewage discharge to the Thames River, flow meters should be installed in all overflow facilities within the municipality.

During 1972, the efficiency of the sewage treatment plant in treating flows directed to it, is indicated to be generally satisfactory based on the analyses results from the laboratory at the sewage treatment plant. It should be noted, however, that

samples of the sewage treatment plant, analysed by the Ministry of the Environment Laboratory in London, generally contained BOD_5 concentrations greater than the concentration indicated by the test performed at the sewage treatment plant laboratory and in excess of the presently recommended discharge limit of 15 ppm.

Chlorination facilities provided allow for chlorination of the secondary effluent only. Any primary effluent discharges and plant by-pass flows are discharged without chlorination to the Thames River. The capacity of the chlorination facilities should be expanded to provide chlorination of all sewage flow directed to the sewage treatment plant in order that the bacterial load in the plant effluent to the Thames River is decreased to acceptable levels.

Studies have been completed at the sewage treatment plant to determine the proper facilities to be installed for phosphorus removal. It is anticipated that these facilities will be installed and operative by the published deadline of the end of 1973. It is noted that items included by the City Engineer in the capital budget for 1972 to 1976 for the water pollution control facilities included alterations to the chlorination facilities in 1974, extension of the aeration section in 1975 and additional pumping facilities and final settling tanks in 1976.

The Water Quantity Management and Water Quality Branches of the Ministry of the Environment are presently engaged in a water

resources study of the Thames River Basin. Waste loading assimilation studies are being conducted to determine permissible levels of discharge of BOD_5 and suspended solids from individual sewage treatment plants in the Thames River Basin. Pending the results of these studies, a higher degree of sewage treatment than presently achieved by the type of sewage treatment plant serving the City of Woodstock may be required. However, with the sewage flows to the sewage treatment plant during 1972 at 100 percent of secondary treatment capacity, there is a present need for improvements and additions to the present sewage treatment plant to provide treatment of all sewage flows directed to these works to a level presently acceptable for discharge to the Thames River. To ensure a minimum period for the completion of these improvements, the City of Woodstock should retain a consulting engineer as soon as possible. Determination of the appropriate facilities to be constructed should be made in consultation with municipal officials and Ministry of the Environment personnel to ensure that the needs of the City of Woodstock are met and satisfactory water quality of the Thames River maintained.

The results of the water pollution survey indicated that at the time of sampling, there were relatively few discharges causing gross contamination of the local watercourses within the City of Woodstock. However, contamination of Golf Course Creek in the Mill Creek - Parkinson Road area was indicated. An investigation

of the storm sewer passing through the sanitary landfill site should be undertaken to determine if leachate is infiltrating the storm sewer. In addition, an investigation for illegal sanitary and industrial waste connections to the storm sewer on Mill Street and Parkinson Road should also be made and severance made where found.

The south sewage disposal area while no longer in use, even for overflow purposes, remains as a public health hazard. The ponded water area should be drained and the holding tank covered or fenced.

The major source of pollution causing deterioration of the water quality of the Thames River as it passes through the City of Woodstock was the municipal sewage treatment plant effluent. A substantial increase in the BOD_5 and suspended solids concentration in the Thames River was noted as well as extremely high increases in bacteriological counts. The deterioration in water quality was attributed to the effluent from the sewage treatment plant. The need, as noted previously, for more effective chlorination and a higher degree of treatment achieved by the sewage treatment plant is indicated.

RECOMMENDATIONS

1. With the raw sewage flows during 1972 at 100 percent of secondary treatment capacity and the incapability of the chlorination facilities to treat all flows directed to the sewage treatment

plant, there is a present need for improvements and additions to the sewage treatment plant to provide treatment of all sewage flows directed to these works to a level acceptable for discharge to the Thames River. The City of Woodstock should retain a consulting engineer to determine and design the appropriate facilities to be constructed.

2. With the documented infiltration in the trunk sewers and the average daily raw sewage flow during 1972 at 110 percent of the average daily water consumption, the need for an extensive infiltration study of the sanitary sewer collector system is indicated, to search out defective sections of sewer. A construction program of rehabilitation should be initiated following any infiltration studies.

3. The consulting engineer should consider closely the association between high infiltration rates in the sewage collector system and hydraulic capacity of the sewage treatment plant in determining the appropriate facilities to be constructed.

4. None of the overflow sewers from the sanitary sewer collector system located during the field survey were metered. In order to determine the quantity and frequency of raw sewage by-passing and thus a determination of the pollution load to the Thames River, flow meters should be installed in all overflow facilities within the City of Woodstock.

5. An investigation of the storm sewer passing through the old sanitary landfill site on Parkinson Road should be carried out to determine if leachate is infiltrating the storm sewer and corrective action pursued if necessary. The storm sewers on Mill Street and Parkinson Road should be investigated for illegal sanitary and industrial waste connections and severance made where found.

6. The holding tank and ponded water area in the South Sewage Disposal area remain as a public health hazard and as such should be drained and the holding tank covered or fenced.

Prepared by .....

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APPENDIX I

CITY OF WOODSTOCK

WATER POLLUTION SURVEY

APPENDIX I

SIGNIFICANCE OF LABORATORY RESULTS

All the laboratory tests included in this report were performed at the Ministry of the Environment laboratories in London.

A. Bacteriological Examination

TOTAL COLIFORM organisms include a wide variety of bacteria ranging from the genus (group) Escherichia Coli, which originate mainly in the intestines of man and other warm blooded animals, to the genera Citrobacter and Enterbacter aerogenes. The latter genera are basically found in soil, but are also present in faeces in small numbers. The presence of total coliforms in water may indicate soil run-off or, more important, less recent faecal pollution since organisms of the Enterobacter-Citrobacter groups tend to survive longer in water than do members of the Escherichia Coli group, and even to multiply when suitable environmental conditions exist.

The FAECAL COLIFORM organisms are those coliform bacteria which are of intestinal origin and usually outnumber all other coliform types in human and animal intestines by a ratio of more than 500 to 1.

Most of the coliform bacteria found by the faecal coliform test are of the genus Escherichia Coli. However, their death rate outside the warm body is the greatest and accordingly, if the coliform present in the water are primarily faecal coliforms

and their number is high, the pollution is probably nearby and recent. Smaller numbers but a high proportion of faecal coliforms may indicate nearby pollution with counts reduced by dilution.

The results of the examinations are reported as "MF Coliform Count per 100 ml."

The Ministry's Guidelines and Criteria for Water Quality Management in Ontario (November 1972) indicate that water used for total body contact recreation can be considered impaired when the total coliform, faecal coliform, and/or faecal streptococcus geometric mean density exceeds 1,000,100, and/or 20 per 100 ml, respectively.

NOTE: The term "geometric mean" refers to a type of average. Mathematically speaking, the geometric mean of a set of N numbers is the Nth root of the product of the numbers; in practice, it is computed by the use of logarithms.

B. Chemical Analyses

Biochemical Oxygen Demand (BOD)

Biochemical Oxygen Demand is reported in parts per million (ppm), and is an indication of the amount of oxygen required for the stabilization of decomposable organic matter in water. The completion of the laboratory test requires five days under the controlled incubation temperature of 20°C.

Biochemical Oxygen Demand directly affects the dissolved oxygen level within the watercourse; subsequently it must be limited

in order to maintain dissolved oxygen levels in the receiving water to sustain the local aquatic life.

Solids

The value for solids, expressed in parts per million, is the sum of the values for the suspended and the dissolved matter in the water. The concentration of suspended solids is generally the most significant of the solids analyses with regard to surface water quality. The effects of suspended solids in water are reflected in difficulties associated with water purification, decomposition in streams, and injury to the habitat of fish.

Total Kjeldahl Nitrogen

Total Kjeldahl is a measure of the total nitrogenous matter present except that measured as nitrite and nitrate nitrogens. The Total Kjeldahl, less the ammonia nitrogen, measures the organic nitrogen present. Ammonia and organic nitrogen determinations are important in determining the availability of nitrogen for biological utilization. The normal range for Total Kjeldahl would be 0.1 to 0.5 ppm.

Phosphorus

Phosphorus is a major element of municipal sewage as a result of the utilization of synthetic detergents. To a certain extent, phosphorus is a highly desireable element in maintaining

a proper balance between plant and animal life in water. However, excessive and prolonged discharges will upset this balance and create an over-abundance of algae, weeds and nuisance organisms. Excessive growths of algae have been found developing in lakes when the average concentration of inorganic phosphorus was over 0.01 ppm.

C. Abbreviations and Symbols

BOD	-	Biological Oxygen Demand
Susp. Solids	-	Suspended Solids
Total Kjeldahl	-	Total Kjeldahl Nitrogen
MF	-	Membrane Filter
Ch	-	32-ounce sample taken, and submitted for chemical analyses
Ba	-	6-ounce sample taken, and submitted for bacteriological examination
ml	-	Millilitre
mgd	-	Million gallons per day
gpd	-	gallons per day
gpm	-	gallons per minute
L	-	less than

APPENDIX II

TABULATION

OF

FIELD OBSERVATIONS

WATER POLLUTION SURVEY

GOLF COURSE CREEK

CITY OF WOODSTOCK

Sampling Point No.	Location of Outfall and/or Sampling Point	Size of Outfall (inches)	Kind of Outfall	Esti-mated Flow	Obser-vations	Action	Date and Time of Sampling	Weather Condition
UC-01	South of Sixth Ave. at rear of service station (beginning of ditch)	36"	Concrete	10 gpm	Murky, iron deposits	Ch & Ba	Apr.26/72 1:15 pm	Sunny and mild. Apr.25/72. Sunny and mild. Apr.26/72.
UC-02	At dam on north end of pond in golf course		Watercourse	20 gpm	Clear	ch & Ba	Apr.26/72 1:30 pm	"
UC-03 cc-72	Discharge to Cedar Creek at CPR right-of-way		Watercourse	20 gpm	Clear	Ch & Ba	Apr.26/72 1:45 pm	"
UC-04	At Fifth Avenue north-west corner.	15"	CMP storm sewer	0	Dry - no indication of recent flow			
UC-05	Land drain opposite Louis Transport	6"	Tile land drain	0	Dry-indication of recent flow			

WATER POLLUTION SURVEY

CEDAR CREEK

CITY OF WOODSTOCK

Sampling Point No.	Location of Outfall and/or Sampling Point	Size of Outfall (inches)	Kind of Outfall	Esti-mated Flow	Obser-vations	Action	Date and Time of Sampling	Weather Condition
cc-01	Cedar Creek at Pattullo Road	–	Watercourse	–	Clear	Ba, Ch	Apr. 25/72 12.20 pm	Sunny & mild Apr. 25/72 overcast with slight precipitation Apr. 24/72
cc-02	Approx. 300' south of Parkinson Rd.	24"	Concrete Storm Sewer free flowing	4 gpm	Clear	–	–	
cc-04	Approx, 250' south of Parkinson Rd.	8"	Steel land drain free flowing	2 gpm	Clear	–	–	"
cc-06	Approx. 75' south of Parkinson Rd.	6"	Concrete land drain free flowing	1 gpm	Clear	–	–	"
cc-08	Cedar Creek at Parkinson Road		Watercourse		Clear	Ba,Ch	Apr. 25/72 2.00 pm	"

WATER POLLUTION SURVEY

CEDAR CREEK

CITY OF WOODSTOCK

Sampling Point No.	Location of Outfall and/or Sampling Point	Size of Outfall (inches)	Kind of Outfall	Esti-mated Flow	Obser-vations	Action	Date and Time of Sampling	Weather Condition
cc-10	Schell - Clark Drain outfall at Parkinson Rd.	60"x34"	Concret Arch Storm Sewer	5 gpm	Clear	Ba,Ch	Apr. 25/72 2.00 pm	Sunny & mild Apr. 25/72 overcast with slight precipitation Apr. 24/72
cc-12	Same as above (twin pipes)	60"x34"	Concrete Arch Storm Sewer	1 gpm	Clear	–	–	
cc-14	Southside Park Pond opposite Hydro Station	9"	Steel drain pipe	–	Dry - no recent flow	–	–	"
cc-16	Southside Park Pond opposite water work	20"	Concrete Storm Sewer	0.3 gpm	Clear	–		"
cc-18								"

WATER POLLUTION SURVEY

CEDAR CREEK

CITY OF WOODSTOCK

Sampling Point No.	Location of Outfall and/or Sampling Point	Size of Outfall (inches)	Kind of Outfall	Esti-mated Flow	Obser-vations	Action	Date and Time of Sampling	Weather Condition
cc-20	Approx. 350 ft. south of Finkle St.	120"	CMP Storm sewer partly submerged	200 gpm	Clear	–	–	Sunny & mild Apr. 25/72 overcast with slight precipitation Apr. 24/72
cc-22	Approx. 350 ft. south of Finkle Street	60"	CMP Storm sewer free flowing	0.5 gpm	Clear	–	–	
cc-24	North-east corner of Bridge at Finkle Street	28"	Concrete storm sewer free flowing	2 gpm	Clear	–	–	"
cc-26	Finkle Street - south west corner of bridge	26"	Concrete Storm sewer free flowing	2.0	Clear	–	–	"
cc-28	Approx. 80 ft. west of Finkle Street	26"	Concrete storm sewer partly submerged	1 gpm	Murky	Ch,Ba	Apr. 25/72 3.15 pm	"

WATER POLLUTION SURVEY

CEDAR CREEK

CITY OF WOODSTOCK

Sampling Point No.	Location of Outfall and/or Sampling Point	Size of Outfall (inches)	Kind of Outfall	Esti-mated Flow	Obser-vations	Action	Date and Time of Sampling	Weather Condition
cc-30	Approx. 80ft. west of Finkle St. (twin pipe)	26"	Concrete storm sewer partly submerg-ed	—	Clear	—	—	Sunny & mild Apr. 25/72 overcast with slight precipitation Apr. 24/72
cc-34	Approx. 100' east of Butler Street	4"	Tile Drain Free Flowing	0.2 gpm	Clear	—	—	
cc-36	North East corner Butler Street	14"	Concrete storm sewer free flowing	—	Dry recent flow	—	—	"
cc-38	North west corner Butler Street	16"	Corrugated metal pipe storm sewer free flowing	1.0 gpm	Clear	Ba,ch	April 25/72 3.55 pm	"
cc-40	South-east corner Butler St.	24"	Corrugated metal pipe storm sewer free flowing	3 gpm	Clear	—	—	"

WATER POLLUTION SURVEY

CEDAR CREEK

CITY OF WOODSTOCK

Sampling Point No.	Location of Outfall and/or Sampling Point	Size of Outfall (inches)	Kind of Outfall	Esti-mated Flow	Obser-vations	Action	Date and Time of Sampling	Weather Condition
cc-46	Approx. 150 ft east of Mill St.	8"	Concrete storm sewer free flowing	–	Dry - no recent flow	–	–	Sunny & mild Apr.25/72 overcast with slight precipitation Apr. 24/72
cc-48	Mill St. Bridge North side	–	Storm Sewer	–	Dry- No recent flow	–	–	
cc-50	Mill St. Bridge South side	8"	Corrugated steel pipe storm sewer free flowing	1 gpm	Clear	–	–	"
cc-52	Intersection of Mill St. and Main Street	14"	Tile storm sewer free flowing	1 gpm	Clear	–	–	"
cc-54	Main St. Bridge West side	10"	Free flowing storm sewer	2 gpm	Clear	Ch, Ba	Apr. 25/72 6.15 pm	"

WATER POLLUTION SURVEY

CEDAR CREEK

CITY OF WOODSTOCK

Sampling Point No.	Location of Outfall and/or Sampling Point	Size of Outfall (inches)	Kind of Outfall	Esti-mated Flow	Obser-vations	Action	Date and Time of Sampling	Weather Conditions
cc-56	Cedar Creek at Main St.	Creek Sample		—	Clear	Ch, Ba	Apr. 25/72 6.20 pm	Sunny & mild Apr. 25/72 overcast with slight precipitation Apr. 24/72
cc-58	Winnett St. storm sewer	30"	—	—	Could not locate	—	—	
cc-60	Approx. 400' east of Duke St. at Playground.	10"	Concrete drain partly submerged	1 gpm	Clear	—	—	"
cc-62	Approx. 380' east of Duke St. at playground, south trunk syphon over-flow	15"	Concrete free flowing	—	Dry- no recent flow	—	—	"
cc-64	Duke St. and Dundas Street storm sewer	24"	—	—	could not locate	—	—	"

WATER POLLUTION SURVEY

CEDAR CREEK

CITY OF WOODSTOCK

Sampling Point No.	Location of Outfall and/or Sampling Point	Size of Outfall (inches)	Kind of Outfall	Esti-mated Flow	Obser-vations	Action	Date and Time of Sampling	Weather Condition
cc-66	Ingersoll Road Bridge South-east corner	6"	Concrete Storm Sewer	–	–	–	–	Sunny & mild Apr. 25/72 overcast with slight precipitation Apr. 24/72
cc-68	Ingersoll Road Bridge South West Corner	6"	Concrete Storm Sewer free flowing	–	–	–	–	
cc-70	Approx. 180' east of CPR Bridge	12"	Concrete storm sewer free flowing	–	Dry- no recent flow	–	–	"
cc-72 uc-03	Discharge of un-named Creek south-east side of CPR Bridge		Watercourse	20 gpm	Clear	Ba, ch	April 26/72 1.45 pm	Sunny & mild Apr.25 &26 1972
cc-73	Approx. 100' west of the CPR Bridge	6"	Tile Sanitary drain	trickle	Raw sewage discharging	Photo	Apr. 27/72 1.00 pm	Sunny & mild Apr. 26 & 27/72

WATER POLLUTION SURVEY

CEDAR CREEK

CITY OF WOODSTOCK

Sampling Point No.	Location of Outfall and/or Sampling Point	Size of Outfall (inches)	Kind of Outfall	Esti-mated Flow	Obser-vations	Action	Date and Time of Sampling	Weather Condition
cc-74 cc-76	Opposite South sewage disposal area area	_	Natural drainage channel	20 gpm	Green from high algae con-centration draining sewage disposal area.	ch, Ba Photo	Apr. 27/72 1.30 pm	Sunny & mild Apr. 26 & 27 1972
cc-78	Opposite CPR right of way and approx. 300' south west of Dundas St.	_	Drainage Ditch	_	stagnant no odours	_	_	"
cc-80	At Thames River	_	Watercourse		Clear	Ch,Ba	Apr.27/72 1.45 pm	"

WATER POLLUTION SURVEY

THAMES RIVER

CITY OF WOODSTOCK

Sampling Point No.	Location of Outfall and/or Sampling Point	Size of Outfall (inches)	Kind of Outfall	Esti-mated Flow	Obser-vations	Action	Date and Time of Sampling	Weather Condition
TR-01	Approx. 200' down-stream from Pittock Lake Dam	42"	Concrete com-bined sewer overflow partly submerged	-	No recent flow apparent	Photo	Apr.25/72 1:45 pm	Sunny and mild. Apr.25/72. Overcast with slight pre-cipitation Apr.24/72.
TR-03	Thames River at Pittock Lake Dam		Watercourse	-	-	Ba, Ch	Apr.25/72 2:15 pm	"
TR-04	Thames River at Highway #59		Watercourse	-	-	Ch, Ba	Apr.26/72 11:30 am	Sunny and mild. Apr 25 & 26 1972
TR-05	Garbage disposal area north of STP		Natural drain	-	Effluent from pond clear	Ch, Ba	Apr.26/72 12:00 pm	"
TR-06	North Trunk Storm Sewer outfall to ditch opposite Brant Street	48"	Concrete storm sewer - free flowing	10 gpm	Clear	Ch, Ba	Apr.26/72 12:45 pm	"

WATER POLLUTION SURVEY

THAMES RIVER

CITY OF WOODSTOCK

Sampling Point No.	Location of Outfall and/or Sampling Point	Size of Outfall (inches)	Kind of Outfall	Esti-mated Flow	Obser-vations	Action	Date and Time of Sampling	Weather Condition
TR-07	STP outfall at Admiral Street	42"	Concrete effluent pipe partly submerged.		Murky	Ch, Ba Photo	Apr. 26/72 1.10 pm	Sunny & mild Apr. 25 & 26 1972
TR-07A	Thames River at Admiral St.		Watercourse			Ba,Ch	Apr. 26/72 1.15 pm	"
TR-08	North property line of Standard Tube	18"	Corrugated metal pipe free flowing	5 gpm	Clear	Photo		Sunny & mild Apr. 26 and 27/72
TR-09	North west of Bexley Street Pumping station	10"	Concrete over-flow pipe	_	Dry			"
TR-10	Thames River at Governor's Road		Watercourse		Clear	Ba, Ch	Apr. 27/72 1.00 pm	"

WATER POLLUTION SURVEY

THAMES RIVER

CITY OF WOODSTOCK

Sampling Point No.	Location of Outfall and/or Sampling Point	Size of Outfall (inches)	Kind of Outfall	Esti-mated Flow	Obser-vations	Action	Date and Time of Sampling	Weather Condition
TR-11	Approx. 200' south of CPR Bridge	–	South sewage disposal area effluent pipe totally submerged	–	No recent flow evident	–	–	Sunny & mild Apr. 26 & 27 1972
TR-12	Thames River at CNR Bridge	–	Watercourse	–	Clear	Ba, Ch	Apr. 27/72 4.00 pm	"

WATER POLLUTION SURVEY

SPRING CREEK

CITY OF WOODSTOCK

Sampling Point No.	Location of Outfall and/or Sampling Point	Size of Outfall (inches)	Kind of Outfall	Esti-mated Flow	Obser-vations	Action	Date and Time of Sampling	Weather Condition
SC-01	Clark Street at CNR right-of-way	24"	Concrete Storm sewer	2 gpm	Clear	Ba, Ch	Apr.28/72 11:00 pm	Sunny & Mild. Apr.27 & 28, 1972
SC-02	Parker outlet	10" conc. 8" csp	Storm Sewer outfalls - partly sub-merged		No flow			"
SC-03	Outlet at east side of Norwich Ave. Box Culvert	24"	Concrete storm sewer	200 gpm	Clear			"
SC-04	Inlet at west-side of Norwich Ave. Box Culvert	27"	Concrete storm sewer	200 gpm	Clear			"
SC-05	Outlet to ditch 700' east of Wilson Street	27"	Concrete storm sewer	200 gpm	Clear		Apr.28/72 11:30 pm	"
SC-06	Spring Creek at Wilson Street		Watercourse		Clear	Ba, Ch	Apr.28/72 11:45 pm	"

WATER POLLUTION SURVEY

SPRING CREEK

CITY OF WOODSTOCK

Sampling Point No.	Location of Outfall and/or Sampling Point	Size of Outfall (inches)	Kind of Outfall	Esti-mated Flow	Obser-vations	Action	Date and Time of Sampling	Weather Condition
SC-07	Drain from Burtch Street to Spring Creek at Henry St.		Watercourse	3 gpm	Clear	Ba, Ch	Apr.28/72 12:00 pm	Sunny and Mild. Apr.27 & 28, 1972
SC-08 cc 20&22	Discharge of Spring Creek to Cedar Cr.	120" 60"	CMP Storm Sewers	200 gpm	Clear			"

WATER POLLUTION SURVEY

SCHELL - CLARK DRAIN

CITY OF WOODSTOCK

Sampling Point No.	Location of Outfall and/or Sampling Point	Size of Outfall (inches)	Kind of Outfall	Esti-mated Flow	Obser-vations	Action	Date and Time of Sampling	Weather Condition
S-C-01	Beginning of piped drain at Parkinson Road east of Maud St.			3 gpm	Clear	Ba, Ch	Apr. 26/72 3.00 pm	Sunny and mild Apr. 25 & 26
S-C-02	Drainage channel enters approx. 600' south east of Shnell-Clark Drain & Norwich St.			1 gpm	Clear	—	—	"
S-C-03	Schell-Clark Drain outfall to Cedar Creek at Parkinson Road	twin 60"x39"	Concrete Arch Storm Sewer	5 gpm	Clear	Ba,Ch	Apr. 26/72 2.00 pm	"

WATER POLLUTION SURVEY

PITTOCK LAKE

CITY OF WOODSTOCK

Sampling Point No.	Location of Outfall and/or Sampling Point	Size of Outfall (inches)	Kind of Outfall	Esti-mated Flow	Obser-vations	Action	Date and Time of Sampling	Weather Condition
PL-S-01	Leinster Street	42"	Concrete storm sewer - free flowing	10 gpm	clear	Ba,Ch photo	Apr.25/72 1:45 pm	Sunny and mild Apr.25/72. Overcast & slight pre-cipitation Apr.24/72
PL-S-03	At Dam	12"	Concrete storm sewer - free flowing	5 gpm	clear	-	-	-
PL-S-04	North of Clarke Street at Pittock Lake		Natural channel	35 gpm	clear	Ba, Ch	Apr.27/72 5:30 pm	Sunny and mild. Apr.26 & 27 1972
PL-S-05	Approx. 2000' west of Lansdowne Ave. at Pittock Lake		Natural channel	35 gpm	clear	Ba, Ch	Apr.27/72 5:00 pm	"
PL-S-06	Approx. 1000' west of Lansdowne Ave. at Pittock Lake		Land drainage channel	5 gpm	clear	-	-	"

WATER POLLUTION SURVEY

PITTOCK LAKE

CITY OF WOODSTOCK

Sampling Point No.	Location of Outfall and/or Sampling Point	Size of Outfall (inches)	Kind of Outfall	Esti-mated Flow	Obser-vations	Action	Date and Time of Sampling	Weather Condition
PL-S-07	Lansdowne Avenue at Pittock Lake		Land drainage channel	50 gpm	clear	Ba, Ch	Apr.26/72 4:30 pm.	Sunny and mild. Apr.25 & 26 1972
PL-S-08	Approx. 200' east of Lansdowne Ave. at Pittock Lake.		Land drainage channel	50 gpm	clear	Ba, Ch	Apr.27/72 4:30 pm	Sunny & mild. Apr.26 & 27 1972
PL-S-09	Pittock Lake at Lansdowne Ave.		Lake sample		clear	Ba, Ch	Apr.27/72 4:45 pm.	"

APPENDIX III

TABULATION

OF

ANALYSES RESULTS

WATER POLLUTION SURVEY

GOLF COURSE CREEK

CITY OF WOODSTOCK

Sampling Point No.	Description of Sampling Point	5-Day BOD (ppm)	Susp. Solids (ppm)	Total Kjel-dahl (ppm)	Total Phos-phorus (ppm)	Anionic Deter-gents as LAS	Faecal Coliform Count per 100 ml	MF Total Coliform Count per 100 ml
UC-01	South of Sixth Avenue at rear of service station (beginning of ditch)	420	190				L4	1300
UC-02	At dam on north end of pond in golf course	80	20				L4	300
UC-03	Discharge to Cedar Creek at CPR right-of-way	46	10				12	1100

WATER POLLUTION SURVEY

CEDAR CREEK

CITY OF WOODSTOCK

Sampling Point No.	Description of Sampling Point	5-Day BOD (ppm)	Susp. Solids (ppm)	Total Kjel-dahl (ppm)	Total Phos-phorus (ppm)	Anionic Deter-gents as LAS	Faecal Coliform Count per 100 ml	MF Total Coliform Count per 100 ml
cc-01	Cedar Creek at Pattullo Road	0.8	L5	–	–	–	L4	256
cc-08	Cedar Creek at Parkinson Road	1.2	L5	–	–	–	L4	150
cc-10	Schell-Clark Drain Outfall at Parkinson Road	2.0	10	–	–	–	40	7000
cc-28	Storm Sewer Outfall Approximately 80 feet North of Finkle Street	1.8	5	–	–	LO.5	40	170,000
cc-38	Storm Sewer Outfall North-West Corner Butler Street Bridge	2.2	L5	–	–	–	320	400
cc-54	Storm Sewer Outfall Main Street Bridge West Side	LO.5	L5	–	–	–	L4	28

WATER POLLUTION SURVEY

CEDAR CREEK

CITY OF WOODSTOCK

Sampling Point No.	Description of Sampling Point	5-Day BOD (ppm)	Susp. Solids (ppm)	Total Kjeldahl (ppm)	Total Phosphorus (ppm)	Anionic Detergents as LAS	Faecal Coliform Count per 100 ml	MF Total Coliform Count per 100 ml
cc-56	Cedar Creek at Main Street	1.2	5	–	–	–	12	1400
cc-72 uc-03	Discharge of Unnamed Creek south-east side of C.P.R. Bridge	46	10	–	–	–	12	1100
cc-74 cc-76	Drainage channels from South Sewage Disposal Area	11	20	6.6	1.6		4000	110,000
cc-80	Cedar Creek at confluence with Thames River	2.4	L5	–	–	–	128	120,000

WATER POLLUTION SURVEY

THAMES RIVER

CITY OF WOODSTOCK

Sampling Point No.	Description of Sampling Point	5-Day BOD (ppm)	Susp. Solids (ppm)	Total Kjeldahl (ppm)	Total Phosphorus (ppm)	Anionic Detergents as LAS	Faecal Coliform Count per 100 ml	MF Total Coliform Count per 100 ml
TR-03	Thames River at Pittock Lake Dam	1.8					12	310
TR-04	Thames River at Highway #59	2.4	10				L 4	700
TR-05	Garbage disposal area north of STP. Effluent from ponded water	2.2	5				L 4	192
TR-06	North Trunk Storm Sewer discharge to ditch opposite Brant Street	2.0	5				L 4	240
TR-07	STP outfall at Admiral Street	46	30				10,000	20,000
TR-08	Thames River at Admiral Street	2.4	10				L 4	220

WATER POLLUTION SURVEY

THAMES RIVER

CITY OF WOODSTOCK

Sampling Point No.	Description of Sampling Point	5-Day BOD (ppm)	Susp. Solids (ppm)	Total Kjel-dahl (ppm)	Total Phos-phorus (ppm)	Anionic Deter-gents as LAS	Faecal Coliform Count per 100 ml	MF Total Coliform Count per 100 ml
TR-10	Thames River at Governor's Road	6.5	10				32	80,000
TR-12	Thames River at CNR Bridge	4.8	10				470	30,000

WATER POLLUTION SURVEY

SPRING CREEK

CITY OF WOODSTOCK

Sampling Point No.	Description of Sampling Point	5-Day BOD (ppm)	Susp. Solids (ppm)	Total Kjeldahl (ppm)	Total Phosphorus (ppm)	Anionic Detergents as LAS	Faecal Coliform Count per 100 ml	MF Total Coliform Count per 100 ml
SC-01	Clark Street at CNR right-of-way	2.8	L 5				L 4	1100
SC-06	Spring Creek at Wilson Street	1.4	L 5				68	11000
SC-07	Drain from Burtch Street to Spring Creek at Henry Street	2.6	5				36	2100

WATER POLLUTION SURVEY

Schell - Clark Drain

CITY OF WOODSTOCK

Sampling Point No.	Description of Sampling Point	5-Day BOD (ppm)	Susp. Solids (ppm)	Total Kjel-dahl (ppm)	Total Phos-phorus (ppm)	Anionic Deter-gents as LAS	Faecal Coliform Count per 100 ml	MF Total Coliform Count per 100 ml
S-C-01	Beginning of piped drain at Parkinson Road east of Maud Street.	2.2	10	–	–	–	L4	400
S-C-03 cc-10	Outfall to Cedar Creek at Parkinson Road	2.0	10	–	–	–	40	7000

AN[redacted]SE[redacted]ESU[redacted]ET[redacted]

WATER POLLUTION SURVEY

PITTOCK LAKE

CITY OF WOODSTOCK

Sampling Point No.	Description of Sampling Point	5-Day BOD (ppm)	Susp. Solids (ppm)	Total Kjel-dahl (ppm)	Total Phos-phorus (ppm)	Anionic Deter-gents as LAS	Faecal Coliform Count per 100 ml	MF Total Coliform Count per 100 ml
PL-S-01	Storm Sewer Outfall at Leinster Street	0.5	10	-	-	-	L 4	24
PL-S-04	Land drainage channel north of Clarke Street at Pittock Lake	1.8	L 5	-	-	-	-	900
PL-S-05	Land drainage channel approx. 2000' west of Lansdowne Ave. at Pittock Lake	1.2	L 5	-	-	-	28	880
PL-S-07	Land drainage channel at Lansdowne Ave. and Pittock Lake	2.2	L 5	-	-	-	L4	1300
PL-S-08	Land drainage channel approx. 200' east of Lansdowne Avenue at Pittock Lake	1.0	L 5	-	-	-	L4	80
PL-S-09	Pittock Lake at Lansdowne Avenue	2.2	L 5	-	-	-	L4	160

APPENDIX IV

TABLE I

SEWAGE FLOWS 1972

Month	Total Receiving Secondary Treatment	Average Day	By-Passed Secondary Treatment	By-Passed Plant
January	128,490,000	4,144,838	5,113,000	1,116,000
February	109,417,000	3,773,000	942,000	-
March	150,718,200	4,861,877	23,749,000	3,994,000
April	147,431,000	4,914,366	17,380,000	1,732,000
May	150,961,300	4,869,719	10,396,000	1,046,000
June	136,624,000	4,554,133	4,446,000	852,000
July	139,100,000	4,487,096	2,419,000	797,000
August	142,341,000	4,571,645	3,250,000	2,820,000
September	121,568,000	4,052,267	2,852,000	562,000
October	127,583,000	4,115,591	3,338,000	1,061,000
November	142,334,000	4,744,480	2,403,000	570,000
December	149,648,000	4,827,355	5,080,000	1,914,000
Total	1,646,215,500		81,368,000	16,464,000
Percent of Metered Flow	94.6%		4.7%	0.7%
Average Day	4,510,000			

APPENDIX IV

TABLE II

SUMMARY OF AVERAGE DAILY SEWAGE FLOW
AND AVERAGE DAILY WATER CONSUMPTION

YEAR	AVERAGE DAILY SEWAGE FLOW	AVERAGE DAILY WATER CONSUMPTION
1968	3.82	3.40
1969	4.01	3.73
1970	4.17	3.84
1971	4.05	4.27
1972	4.51	3.99

APPENDIX V

TABLE I

PLANT LOADING AND PLANT EFFICIENCY
Summary of Weekly Test Results

YEAR	RAW SEWAGE BOD	RAW SEWAGE Susp. Solids	FIND EFFLUENT BOD	FIND EFFLUENT Susp. Solids	REMOVAL EFFICIENCY BOD	REMOVAL EFFICIENCY Susp. Solids
1968	173	262	14	15	92%	94%
1969	151	276	14	15	91%	95%
1970	109	158	11.2	10	89%	94%
1971	120	203	8	10	93%	95%
*1971	168	168	22	5	87%	97%
1972	129	231	12	11	91%	95%
**1972	215	218	24	9	89%	96%

* Based on 6 sets of samples collected by OWRC staff.

** Based on 7 sets of samples analyzed by the Ministry of the Environment Laboratory.

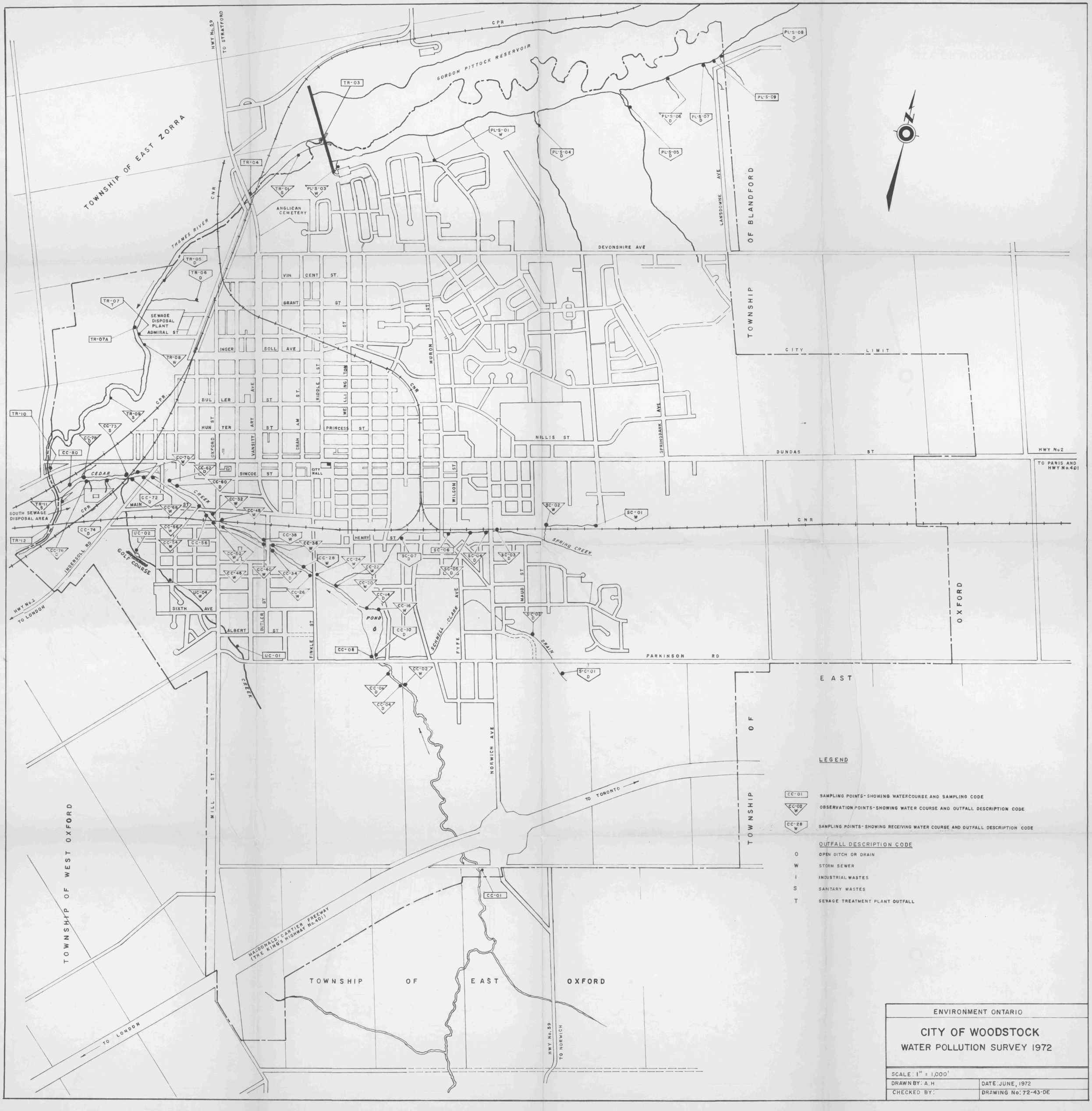
APPENDIX VI

CAPITAL BUDGET

1972 - 1976

POLLUTION CONTROL FACILITY EXPENDITURES

1972	-	Storm Trunk Sewers	- $145,000
	-	Bexley Pumping Station (allowance for increased costs)	- $100,000
1973	-	Storm Trunk Sewers	- $ 60,000
	-	Pollution Control Plant Phosphorus Removal Facilities	- $100,000
1974	-	Storm Trunk Sewers	- $ 60,000
	-	Pollution Control Plant Improvement and Chlorine Facilities	- $ 20,000
1975	-	Storm Trunk Sewers	- $ 60,000
	-	Pollution Control Plant Extension of Aeration Section	- $100,000
1976	-	Storm Trunk Sewers	- 60,000
	-	Pollution Control Plant Final Settling Tank Additional Pumping Facilities	- $100,000



LEGEND

- CC-01 — SAMPLING POINTS - SHOWING WATERCOURSE AND SAMPLING CODE
- CC-02 W — OBSERVATION POINTS - SHOWING WATER COURSE AND OUTFALL DESCRIPTION CODE
- CC-28 W — SAMPLING POINTS - SHOWING RECEIVING WATER COURSE AND OUTFALL DESCRIPTION CODE

OUTFALL DESCRIPTION CODE

O	OPEN DITCH OR DRAIN
W	STORM SEWER
I	INDUSTRIAL WASTES
S	SANITARY WASTES
T	SEWAGE TREATMENT PLANT OUTFALL

ENVIRONMENT ONTARIO

CITY OF WOODSTOCK
WATER POLLUTION SURVEY 1972

SCALE: 1" = 1,000'	
DRAWN BY: A.H.	DATE: JUNE, 1972
CHECKED BY:	DRAWING No: 72-43-DE